

The Advanced Energetic Pair Telescope (AdEPT): A Future Medium-Energy Gamma-Ray Balloon (and Explorer?) Mission

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Gamma-ray astrophysics probes the highest energy, exotic phenomena in astrophysics. In the medium-energy regime, 0.1–200 MeV, many astrophysical objects exhibit unique and transitory behavior such as the transition from electron dominated to hadron dominated processes, spectral breaks, bursts, and flares. Medium-energy gamma-ray imaging however, continues to be a major challenge particularly because of high background, low effective area, and low source intensities. The sensitivity and angular resolution required to address these challenges requires a leap in technology. The Advance Energetic Pair Telescope (AdEPT) being developed at GSFC is designed to image gamma rays above 5 MeV via pair production with angular resolution of 1–10 deg. In addition AdEPT will, for the first time, provide high polarization sensitivity in this energy range. This performance is achieved by reducing the effective area in favor of enhanced angular resolution through the use of a low-density gaseous conversion medium. AdEPT is based on the Three-Dimensional Track Imager (3-DTI) technology that combines a large volume Negative Ion Time Projection Chamber (NITPC) with 2-D Micro-Well Detector (MWD) readout. I will review the major science topics addressable with medium-energy gamma-rays and discuss the current status of the AdEPT technology, a proposed balloon instrument, and the design of a future satellite mission.